The background of the slide features a collage of images: a laptop on the left, a newspaper in the upper center, and a mobile phone on the right. The entire image has a blue-to-purple gradient overlay.

Mipad, a voice-enabled PDA

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Program Manager
Speech Technology Group
Microsoft Research

Agenda

- What is the Speech Technology Group (STG) ?
- Introduction to Mipad
- Mipad Demo!
- Technologies in Mipad
- Mipad future plans
- Speech in your products

STG Mission

- *Develop best-of-breed spoken language engine technologies*
- *Develop compelling new interaction models*
- *Help to integrate speech into MS applications and Windows*

STG Overview

- People - 17 full time, 5 intern/contract
 - ▶ 10 researchers and senior researchers
 - ▶ 5 developers
 - ▶ 1 test lead
 - ▶ 1 program manager

STG History

- Started
- Whisper CSX, SAP1 1.0
- SAP1 2.0, Phone 1.0
- Whistler TTS, SAP1 3.0, Agent
- SAP1 4.0, NT 5.0, Phone 2.0, Encarta
- Transferred 15 FTEs to IIT
- Beefed up research
- Launched Dr Who
- Launched Mipad

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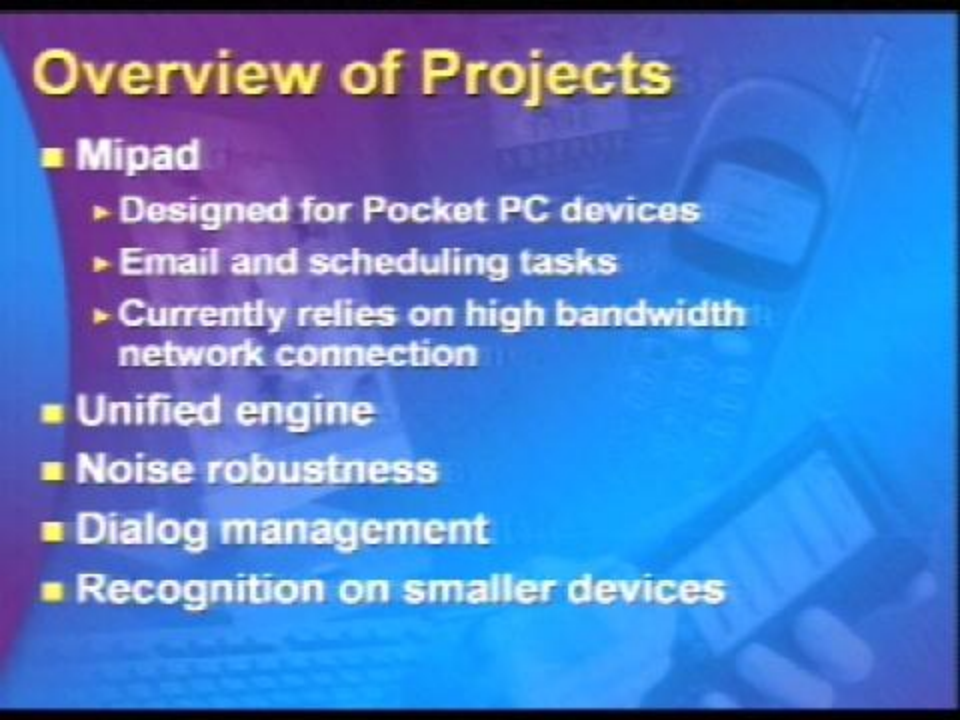
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Overview of Projects

The background of the slide is a blue-tinted image. It shows a hand holding a PDA (Personal Digital Assistant) device, which has a screen and a keypad. Next to it is a flip phone, also with a screen and keypad. The overall theme is mobile computing and communication.

■ Mipad

- ▶ Designed for Pocket PC devices
- ▶ Email and scheduling tasks
- ▶ Currently relies on high bandwidth network connection

■ Unified engine

■ Noise robustness

■ Dialog management

■ Recognition on smaller devices

Mipad

- Microsoft Interactive notePAD
- Demonstration application
 - ▶ More than a prototype, less than a product
 - ▶ Planned for extensive internal use at MS
 - ▶ Software project, but will be available (internally) as a bundled app with Pocket PC

Mipad Goals

- Create a compelling spoken interaction model for PDA tasks
- Identify speech research required to make spoken user interfaces compelling
- Collect real-world data on speech usage
- Transfer the technology and ideas to the product groups

Mipad Positioning



MiPad

Our 1st Dr Who Application

- ▲ *Problems need to be fixed:*
 - ▲ *Entering text is very slow*
 - ▲ *Small screen means functions are hidden*
- ▲ *Good ergonomics for speech+pen*
 - ▲ *Two complementary modalities*
- ▲ *Multimodal interface enhances usability*
 - ▲ *Tap-driven CSR and SLU*
 - ▲ *Overcome today's SLU technology*



Mipad Features

■ Email tasks

- ▶ Send/read new email
- ▶ View inbox and other folders
- ▶ Limited search and filtering

■ Schedule Tasks

- ▶ New Appointment
- ▶ View calendar

■ Address book/contact list

- ▶ Look up a person by name

■ Voice browser tasks

- ▶ MSR Beijing collaboration (Chang)

Mipad Schedule

- STG internal trials start in September
- Release to Microsoft Research planned for December
- Availability on MS internal order system for bundling with new Pocket PC devices by Q1 CY'01

Mipad Technologies

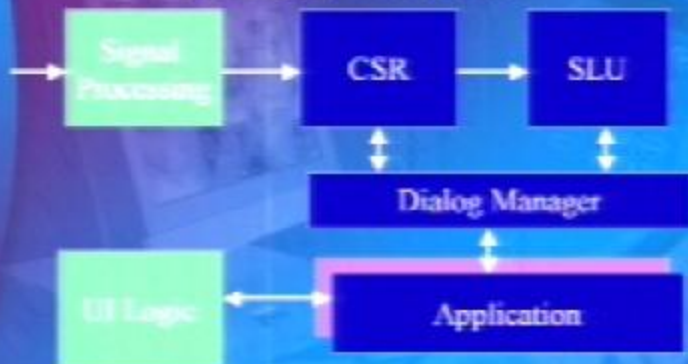
- As a research demonstration application, the technologies Mipad uses are the focus
 - ▶ Unified Engine
 - ▶ Noise Robustness Algorithm
 - ▶ Dialog Management
- The user interface is also a focus
 - ▶ Flexible interaction model
 - ▶ Methods for evaluating speech user interfaces
 - ▶ Guidelines for product groups

MiPad's Architecture

Client

Server

2.5-4.8Mbps, optimized for CSR



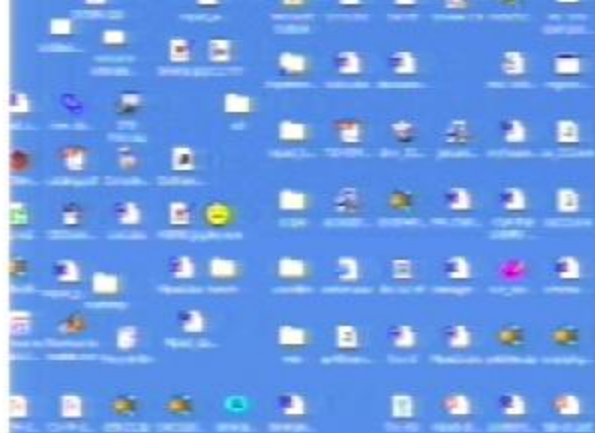
Mipad Demonstration!

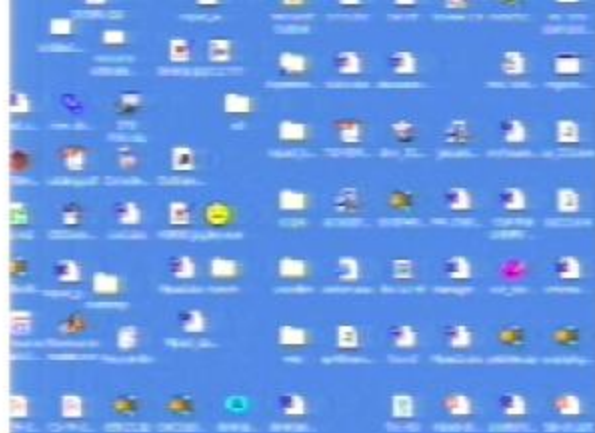


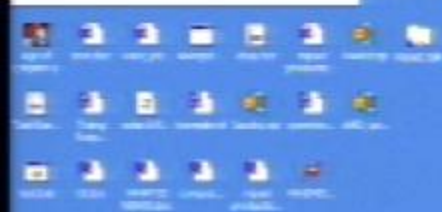


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Username	Admin
First Name	Admin
Last Name	Admin
Phone	0000000000
Address	0000000000
City	0000000000
State	0000000000
Country	0000000000
Zip	0000000000
Gender	Male
Age	0000000000
Weight	0000000000
Height	0000000000
Eye Color	0000000000
Hair Color	0000000000
Religion	0000000000
Marital Status	0000000000
Occupation	0000000000
Education	0000000000
Employment	0000000000
Income	0000000000
Assets	0000000000
Liabilities	0000000000
Net Worth	0000000000
Emergency Contact	0000000000
Medical History	0000000000
Psychological History	0000000000
Substance Use	0000000000
Alcohol Consumption	0000000000
Drug Use	0000000000
Tobacco Use	0000000000
Exercise Habits	0000000000
Dietary Habits	0000000000
Sleep Habits	0000000000
Stress Management	0000000000
Mental Health	0000000000
Physical Health	0000000000
Overall Health	0000000000
Notes	0000000000







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Mipad Interface

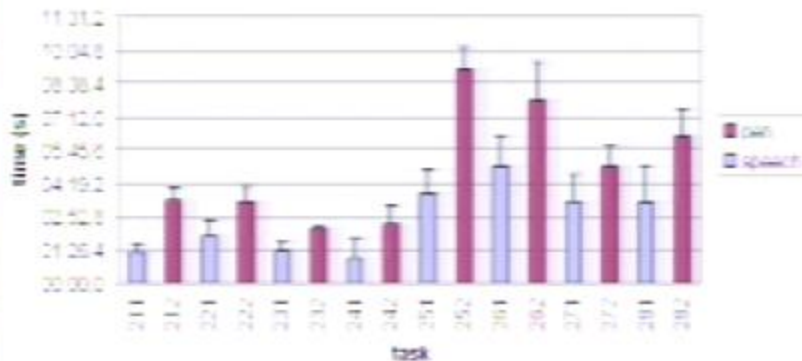
- Flexible interaction model
- Methods for evaluating speech user interfaces
- Guidelines for product groups
- Longitudinal user study
 - ▶ Track real users for a long period of time
 - ▶ Collect real data on real devices
 - ▶ Using instrumented MiPad

Preliminary Benchmark

- **48 tasks**
 - ▶ Each subject gets 24 tasks
 - ▶ $\frac{1}{2}$ using pen and $\frac{1}{2}$ using speech
- **MiPad Throughput**
 - ▶ Overall 30% faster than PPC
 - ▶ Email transcription task is 2 times faster
- **Subjective ratings**
 - ▶ User experience very positive

Preliminary Benchmark

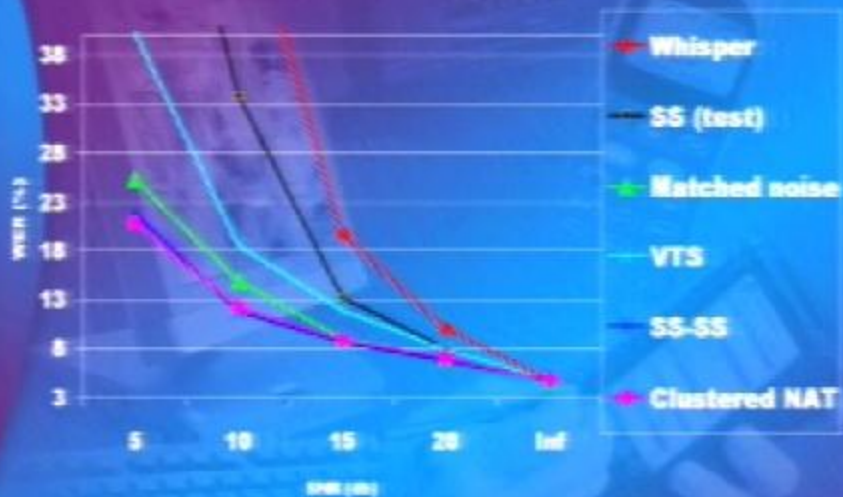
email transcription tasks



Technologies: Noise Robustness

- Today's technology – 2 approaches exist to noise, noise reduction in the feature space and construction of models matching noisy test speech
- Concept - Noise Adaptive Training (NAT) combines above approaches
- Status – initial studies using white noise show great promise, studies using more realistic noise are underway. Plan to integrate into Mipad this summer

White Noise Results



MiPad Built-in Microphone



Technologies: Unified Engine

- Today's technology – recognizer and parser use separate language models
- Concept – the recognizer should use the parser language model (a well-defined grammar) to improve its spoken language understanding performance
- Status – offline studies underway, plan to integrate into Mipad this summer

Technologies: Dialog Management

- Today's technology – grammars must be explicitly defined, context plays little part in grammar
- Concept – Semantic classes provide a degree of abstraction for grammar authors, dialog memory provides context
- Status – integration into Mipad underway

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Technologies: Small Devices

- Today's technology – command and control recognizers are compact, but dictation recognizer is too large to fit on mobile devices
- Status – Mipad release one will use a client-server architecture to overcome mobile device performance limitations. Research is underway to rectify this

Blind Source Separation

- In a sound-proof room:
 - Left mic (◀) right mic (◀)
 - algorithm offers best published results
 - English (◀), Spanish (◀)
- In a normal room, it is not working yet

Mipad Futures

- Mipad is just the first step, future directions include:
 - ▶ External products based on this technology
 - ▶ Greater use of dialog and context
 - ▶ Hands-free, eyes-free applications using speech output
 - ▶ Scaling the Mipad server up to a general speech server for other applications

Major Competitors

- DoCoMo's I-Mode: ahead of Europe and USA
- Motorola's Accompli: available in China only
- IBM is to focus on smaller devices



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Speech in your products

- Distributed speech allows products to take advantage of speech recognition without needing the necessary computing resources available locally
- Speech server efforts at MS will expand in the near future
- Local speech recognition is well supported in SAPI 5
- Small device recognition work ongoing

Shameless Plug

- **Several reasons for this talk:**
 - ▶ Technology transfer, stimulate ideas in the product groups
 - ▶ Get ideas and input on Mipad
 - ▶ Inform people about Mipad and the opportunities in STG
- **We have job openings in STG!**
 - ▶ Dev, test, PM, management all needed
 - ▶ Great technology and exciting environment
 - ▶ Contact myself or Xuedong Huang for more information



Where do you want to go
today?

Microsoft